NSCS
المدرسة الوطنية العليا في الأمن السيبراني
NATIONAL SCHOOL OF CYBERSECURITY

21-01-26
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Analysis II - W.S 1

Basic Training Cycle
On classical Real functions

Exercise 1

Study the variations and plot (or draw) the graph of the functions defined by the following equations

$$f(x) = e^x - \frac{x^2}{2} \qquad f(x) = \frac{e^{2x}}{x^2-1}$$

Exercise 2

Study the variations and plot (or draw) the graph of the functions defined by the following equations

$$f(x) = x^{x^2} \qquad f(x) = x^{-\ln x} \qquad f(x) = \ln\left(x + \sqrt{x^2-1}\right) \qquad f(x) = \ln\left(x^2 - \sqrt{x^2-1}\right)$$

Exercise 3

Study the variations and plot (or draw) the graph of the functions defined by the following equations

$$f(x) = \frac{1+\sin x}{1+\cos x} \qquad f(x) = \tan\left(\pi \frac{x}{x^2+1}\right) \qquad f(x) = \frac{1}{\cos x}$$

Exercise 4

1 Solve in $]0,+\infty[$:

$$\log_2(x) + \log_4(x) + \log_8(x) = \frac{11}{2}$$

2 Solve in $\mathbb{R}^2$:

$$\begin{cases} \sin(x+y) = 2x \\ \sin(x-y) = 2y \end{cases}$$

3 Solve in $\mathbb{R}^2$:

$$\begin{cases} x + e^x = y + e^y \\ x^2 + xy + y^2 = 27 \end{cases}$$

Exercise 5

1 Show that for all $x \in \left[0, \frac{\pi}{2}\right]$:

$$\sin x \leq \frac{1}{2}\sqrt{\pi x}$$

2 Deduce that for all $x \in [0,\pi]$:

$$\sin x \leq \frac{\pi}{4}\sqrt{x(\pi - x)}$$

Exercise 6

Let $a \in \left[0, \frac{\pi}{2}\right]$, detremine

$$\lim_{n \to +\infty} \prod_{k=1}^{n} \cos\left(\frac{ka}{n}\right)$$